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(21) International Application Number: PCT/US99/01324		(74) Agents: PRATT, John, S. et al.; Kilpatrick Stockton LLP, Suite 2800, 1100 Peachtree Street, Atlanta, GA 30309-4530 (US).	
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(71) Applicant (for all designated States except US): INTERFACE, INC. [US/US]; Suite 2000, 2859 Paces Ferry Road, Atlanta, GA 30309 (US).			
(72) Inventors; and (75) Inventors/Applicants (for US only): GWILLIAM, Daniel [US/US]; 2212 W. Monterey Avenue, Mesa, AZ 85202 (US). SCOTT, Graham, A. [US/US]; 6144 Old West Point Road, LaGrange, GA 30240 (US).			

(54) Title: COMBINATION CARPET CLEANING BRUSH UNIT, VACUUM AND PILE LIFTER

(57) Abstract

A combination carpet cleaning, vacuum and pile lifter unit. The combination carpet cleaning, vacuum and pile lifter has a carpet brush unit (12), a backpack vacuum unit (14), a flexible hose (18) connecting the carpet brush unit (12) to the backpack vacuum unit (14) and a handle (16) pivotably attached to the carpet brush unit (12). The carpet brush unit (12) has a pair of short bristles, counter-rotating cylindrical brushes (22, 24) that are relatively widely separated and a motor for rotating the brushes. A chamber (48) having slots (35, 37) exists within the carpet brush unit for receiving and re-distributing cleaning powder to a cleaning surface. Adjustable diverter bar strips (32, 34) on each end of the plate (26) positioned relatively close to the brushes provide for controlling the entry of the cleaning powder on and off the plate (26). In an alternative embodiment, this invention operates as a carpet pile lifter. In yet another embodiment, the vacuum component of this invention can be used as an entirely conventional vacuum cleaner.



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COMBINATION CARPET CLEENING BRUSH UNIT, VACUUM AND PILE LIFTER

Field of the Invention

This invention relates in general to the field of carpet cleaning devices, and
5 in particular, to machines for carpet cleaning, vacuuming and pile lifting.

Background of the Invention

Commercial carpet cleaning techniques and equipment have long included
use of cleaning powders that are broadcast onto an area to be cleaned and then
brushed into the carpet using a power device with counter-rotating cylindrical
10 brushes. Such devices are manufactured and/or sold under the name "Host" by
Racine Industries, Inc., 1405 16th St., Racine, Wisconsin 53403, under the name
"Windsor Dri Matic" by Windsor Industries, Inc., 1351 West Stanford Avenue,
Englewood, Colorado 80110, and under the name "Great Little Scrubber, GLS
Series 11," by Whittaker.

15 More recently, such devices have been modified by adding a vacuum cleaner
component attached to a manifold terminating in a downward-facing slot-shaped
intake positioned between the brushes. Racine Industries has manufactured such
units by mounting a vacuum cleaner apparatus above the conventional Host brush
unit, with a hose attached to a manifold and vacuum intake between the brushes.
20 Racine Industries has also manufactured a redesigned unit, again positioning a
vacuum cleaner unit above the brushes but with a housing better integrated with the
base housing that covers the brushes and motor that drives the brushes. The vacuum
inlet positioned between the brushes in the Host units is open toward the floor and
not toward the brushes, so that material is not directed by the brushes directly into
25 the opening. Both Host units are quite heavy and extremely cumbersome to use.
Because of the difficulty encountered in transporting these units, each is offered
with a base that has wheels and on which the unit may be placed and locked into
position for transportation. Moreover, the earlier Host unit can be operated only
under tables and other furniture well off the floor because of the substantial height
30 of the unit even with the handles folded down toward the floor. The newer Host
unit stands upright during operation and cannot be operated under any conventional
tables or other objects because of its height.

The combination brush and vacuum Host units are used by broadcasting cleaning powder on a carpet (typically after it has been vacuumed to remove loose dirt, and a pile lifter may also be used to lift the carpet pile). The powder is then brushed into the carpet using the machine with the brushes rotating but *without* the vacuum activated. Then, after the powder has dried, the machine is again maneuvered over the carpet with *both* the brushes and the vacuum operating.

Pile lifters are another conventional carpet maintenance device. Such devices typically use an aggressive rotating brush to lift carpet pile. They are large, cumbersome and difficult to use.

Therefore, a need exists for a combination carpet cleaning, vacuum and pile lifting machine that is easy to operate and transport and is usable under furniture with a low clearance from the floor and can be used as a stand alone vacuum cleaner.

Summary of the Invention

This invention is a combination carpet cleaning, vacuum and pile lifter unit having a carpet brush unit, a backpack vacuum unit, a flexible hose connecting the carpet brush unit to the backpack vacuum unit and a handle pivotably attached to the carpet brush unit. The carpet brush unit includes a shroud, a pair of short bristle counter-rotating cylindrical brushes, a tray-shaped bottom plate, a means for receiving the flexible hose and a motor for driving the carpet brush unit. A chamber exists within the carpet brush unit for receiving and re-distributing cleaning powder to a cleaning surface. The bottom plate has diverter bar strips on each end of the plate relatively close to the brushes for controlling the entry of cleaning powder on and off the plate.

The handle pivotably attached to the carpet brush unit pivots such that the handle can be dropped to a position substantially parallel to the carpet. In this position, the brushes of the combination carpet cleaning, vacuum and pile lifter operate just as it does when the handle is in a substantially upright position.

The brushes and vacuum component of this invention serve to lift carpet pile but the horizontal forces exerted by the brushes on the carpet balance each other. By using this invention, resistance by an operator is not required as is necessary with conventional single brush pile lifters.

The vacuum component can include a one-half speed control for providing a reduced vacuum force for drawing air containing airborne cleaning powder near the carpet brush unit into the vacuum unit without lifting the cleaning powder off the carpet and out of the brushes. Additionally, this invention operates as a stand along
5 vacuum unit.

Objects of this invention include:

To provide a combination cleaning, vacuum and pile lifter unit overcoming the problems and shortcomings of the prior art.

To provide a combination brush, vacuum and pile lifter that utilizes a
10 conventional low profile carpet brush unit, and a conventional commercial backpack vacuum unit that is worn on the operator's back and which is connected to the carpet brush unit with a flexible hose. The carpet brush unit has a plastic housing a few inches tall that covers a pair of short bristle, counter-rotating cylindrical brushes that are relatively widely separated and a motor for rotating the brushes. A
15 lightweight handle is pivotably attached to the housing.

To provide a unit that economically achieves the advantages associated with a combination brush and a vacuum cleaner, in an apparatus that is much lighter and easier to transport, and easier to operate. To provide a unit that is usable not only as a cleaning and vacuum unit, but also as an easily operated pile lifter.

20 To provide a unit that operates with a very low profile (less than one foot high) and therefore can be used to clean under many tables and other items of furniture.

To provide a vacuum component of this invention that can be used as an entirely conventional vacuum cleaner.

25 As the following description and accompanying drawings make clear, these and other objects are achieved by this invention.

Brief Description of the Drawings

Fig. 1 is a perspective view of an embodiment of a combination carpet cleaning, vacuum and pile lifter unit, including a carpet brush unit, a handle
30 pivotably attached to the carpet brush unit, a backpack vacuum unit, and a flexible hose for attaching the carpet brush unit to the backpack vacuum unit;

Fig. 2 is a bottom view of the carpet brush unit shown in Fig. 1;

Fig. 3 is a schematic side elevation view of the carpet brush unit shown in Fig. 1; and

Figs. 4A-4C show schematic side elevation views of the carpet brush unit shown in Fig. 3, collecting, extracting and spreading cleaning powder.

5

Detailed Description of the Invention

Fig. 1 shows a combination carpet cleaning, vacuum and pile lifter unit 10 of this invention. The combination carpet cleaning, vacuum and pile lifter unit 10 includes a carpet brush unit 12, a backpack vacuum unit 14, a handle 16 pivotably attached to the carpet brush unit 12, and a flexible hose 18 connected between the backpack vacuum unit 14 and the carpet brush unit 12. A suitable power source is operatively connected to the combination carpet cleaning, vacuum and pile lifter unit 10 shown in Fig. 1 such as a conventional electrical cord. Alternatively, this invention may be powered using a battery power source. The carpet brush unit 12 has a low profile (preferably less than five inches) for operating under furniture, equipment and the like, that is located only a few inches above a surface to be cleaned.

The combination carpet cleaning, vacuum and pile lifter unit 10 is operated with the handle 16 in a substantially upright position relative to a cleaning surface. The handle 16 is pivotably attached to the carpet brush unit 12 by a lever 20 attached to an upper portion 21 of the carpet brush unit 12. The handle 16 pivots to a position substantially parallel to the carpet, permitting the carpet brush unit 12 of this invention to operate under very low furniture.

Fig. 2 shows a bottom view of the carpet brush unit 12. The carpet brush unit 12 includes a shroud 21, a pair of relatively short bristle counter-rotating cylindrical brushes 22, 24, a tray-shaped bottom plate 26, a hole 28 for receiving the flexible hose 18 and a motor (shown in Fig. 1 as reference number 19) for driving the carpet brush unit 12. The plate 26 includes a tray 30 having a first strip 32 at one side of the tray 30 and a second strip 34 at an opposite side of the tray 30. Holes, 36, 38, 40, 42, 44 and 46 provide for removably attaching the plate 26 to the shroud 21 using screws (not shown).

The flexible hose 18 may be connected to the carpet brush unit 12 by positioning the end of the flexible hose 18 remote from the backpack vacuum unit

14 in a suitably sized hole 28 in the top cover of the carpet brush unit 12 in a position midway between the brushes. An underside of the shroud 52 defines two opposing side walls 39, 41 near the brushes 22, 24. Slots 35, 37 in the side walls 39, 41 are provided so that air, cleaning powder and other debris may be drawn through the slots 35, 37 from the region near of the brushes 22, 24 into the carpet brush unit 12. When the vacuum function of the backpack vacuum unit 14 is in operation, the air, cleaning powder and other debris is drawn into hole 28 and through flexible hose 18 and thence into the vacuum backpack 14 dirt collection chamber 49.

As will be appreciated by reference to Figures 3 and 4A - 4C, strips 32 and 34 cooperate with the slots 35, 37 and brushes 22 and 24 to direct powder and dirt into a chamber 48 of the carpet brush unit 12.

Fig. 3 illustrates a schematic side elevation view of the carpet brush unit 12 of this invention showing the sides of the tray 30 extended. This may be accomplished by gluing or otherwise fastening diverter bars or strips 32, 34 of aluminum plate or other suitable material along the edges of the tray and extending adjacent to the brushes to reduce, in effect the space ("X" in Fig. 3) between tray 30 and the brushes 22, 24. This causes dry powder initially to be taken up by the brushes 22, 24 (while the vacuum is not in use or is at a low power level) and to be deposited in the tray 30. A chamber 48 exists between the tray interior 50 and the underside of the shroud 52. After the chamber 48 becomes full, the powder begins to be redistributed on the carpet by the brushes. This significantly improves the cleaning effectiveness of this combination unit because the powder application is leveled or "evened-out."

Optimum spacing "X" between the brushes and adjacent edges of the strips can be determined by trial and error. Preferably distance "X" is about one-fourth inch. This permits cleaning powder lifted by the brushes 22, 24 to get past the strips 32, 34, through the slots 35, 37, and into the tray interior 50, with the strips 32, 34 functioning like the front lip of a dust pan. It is also preferable that the shroud 21 be positioned close to the brushes but with sufficient space "Y" for movement of the cleaning powder between the brushes 22, 24 and shroud 21 during re-distribution of cleaning powder collected onto the tray interior 50 back into the carpet 54.

Optimum separation "Y" can again be determined by trial and error. Preferably, the separation distance "Y" is about one-fourth inch.

While the illustrated diverter bar strips 32, 34 are shown fixed in Fig. 3, they can be movable in order to adjust the cleaning powder uptake or, if desired, block it entirely, by permitting the strips 32, 34 to entirely block cleaning powder entry into the tray interior 50. For instance, the strips 32, 34 can be attached to the sides of the tray 30 using a hinge mechanism, so that the strips 32, 34 have the form of a piano hinge. This and other adjustable structures that may be remotely controlled permit control of cleaning powder uptake and control of its re-deposition on the carpet 54. In an alternative embodiment, re-depositing the cleaning powder from the tray interior 50 onto a carpet 54 is controlled by downward air pressure from backpack vacuum unit 14 through the flexible hose 18 attached to the hole 28 in the carpet brush unit 21.

The handle 16 on the carpet brush unit 12 can be positioned almost parallel to the floor while the cleaning brushes 22, 24 are still in operating position relative to the floor. Additionally, the flexible hose 18 can be attached to the handle 16 assuming essentially the same position in relation to the backpack vacuum unit 14 when the handle 16 is substantially upright, because the backpack vacuum unit 14 is entirely clear of the carpet brush unit 12. The configuration of the combination carpet brush and vacuum unit 10 provides for operating this invention under very low furniture.

Figs. 4A - 4C shows collecting, extracting and spreading particulate utilizing the carpet brush unit 12 of this invention. Fig. 4A shows the carpet brush unit 12 collecting particulate from a carpet 54. Particulate, for example, cleaning powder 58, is broadcast onto a carpet 54 or other surface to be cleaned. With the vacuum function of the backpack vacuum unit 14 off or operating on low speed, the cleaning powder 58 begins to collect on and between the short bristle counter-rotating cylindrical brushes 24, 26. The position of the strips 32, 34 relative to the brushes 24, 26 assist in the movement of the cleaning powder 58 from the brushes, through the slots 35, 37 and onto the interior 50 of the tray 30. As the brushes 24, 26 continue to rotate more cleaning powder 58 is taken up and deposited onto the tray

interior 50. This process continues until the tray interior 50 is filled with cleaning powder 60.

Fig. 4B shows cleaning powder 60 redepositing onto the carpet 54. Once full, the cleaning powder 60 spills out of the slots 35, 37 into an area between the strips 32, 34 and the shroud 21. The strips 32, 34 are positioned such that the cleaning powder 60 moves from the strips 32, 34 and onto the brushes 24, 26. Sufficient space "Y" exists between the shroud 21 and the brushes 24, 26, to allow the cleaning powder 66, 68 to move between and on the brushes 24, 26. As the brushes 24, 26 continue to rotate, the cleaning powder 66, 68 moves from the brushes 24, 26 onto the carpet 54. The redistribution of the cleaning powder 66, 68 provides for a more even distribution of the cleaning powder 70 onto the carpet.

Fig. 4C shows extraction of the cleaning powder 72. To extract the cleaning powder 70 from the carpet the level of the vacuum function of the backpack vacuum unit 14 is increased. The cleaning powder 72 and debris collected on the brushes 24, 26 is drawn through the slots 35, 37 and onto the chamber 48 of the carpet brush unit 12. Ultimately, these particles 72 are swept up through the hole 28 and into the flexible hose 18. The particles travel within the flexible hose 18 and are subsequently deposited into the dirt collection chamber 49 of the backpack vacuum unit 14.

In another aspect of this invention, the combination of brushing action and vacuum serves very successfully to lift carpet pile. As a result, this invention can be used as a pile lifter, substituting for expensive, difficult to operate machines manufactured for that single purpose. This dual brush pile lifter 10 is easier to operate since the horizontal forces exerted by the brushes 22, 24 on the carpet 54 tend to balance each other and do not need to be resisted by the operator to the extent necessary with conventional single brush pile lifters. This makes this combination unit 10 feel "self-propelled" in use by comparison to conventional single brush pile lifters.

Backpack mounted vacuum units usable to practice this invention include, among others, the "Vac-Pak" unit sold by Windsor and backpack vacuums available from Pro-Team, 5118 North Sawyer Avenue, Boise Idaho 83714.

Another aspect of this invention provides a vacuum unit that operates during a cleaning cycle utilizing rotating brushes 22, 24. In this embodiment, the backpack vacuum unit 14 is capable of operating at two or more power levels. This can be accomplished using a two-speed motor or a motor speed control. Among other
5 approaches, a choke could also be used to reduce the volume of air inlet into the backpack vacuum unit 14 or the volume of air that can be exhausted by the backpack vacuum unit 14.

As is known by those skilled in the art of commercial carpet maintenance, carpet cleaning typically involves broadcasting cleaning powder "dry" on the carpet,
10 brushing the powder into the carpet, and then vacuuming the carpet to remove the cleaning powder and foreign materials. (The cleaning powder actually contains a small amount of water and other solvents when it is spread on the carpet; these volatile components evaporate).

Thus, it is not desirable to operate a vacuum at the same time as initial
15 brushing is occurring if such vacuum operation removes cleaning powder that needs, instead, to be brushed into the carpet pile. Operation of the rotary brushes will, however, tend to cause at least dryer cleaning powder to become airborne, which is undesirable.

This invention solves this problem by removing air in the vicinity of the
20 brushes with the backpack vacuum unit 14 operating at a level that draws air containing airborne cleaning powder in the vicinity of the carpet brush unit 12 into the backpack vacuum unit 14 but is not at a sufficiently powerful level to lift powder off the carpet and out of the brushes. This can be accomplished utilizing the combination carpet cleaning, vacuum and pile lifter unit 10 and operating the
25 backpack vacuum unit 14 at about one-half of its normal speed or power level. A switch 76 shown in Fig. 1 provides for speed and/or power control of the backpack vacuum unit.

An advantage of this invention is that it provides a lightweight, easily transportable, simple to operate combination carpet cleaning, vacuum and pile lifter
30 unit.

Another advantage is that this invention operates with a low profile carpet brush unit that is usable under items of furniture that are relatively low to the floor.

Yet another advantage of this invention is that the handle can be positioned almost parallel relative to the cleaning surface while the cleaning brushes remain in operating position relative to the floor.

5 Still another advantage of this invention is that cleaning power initially taken up by the brushes and deposited on the tray of the carpet brush unit is redistributed onto the cleaning surface and then vacuumed up which significantly improves the effectiveness of cleaning soiled surfaces because the cleaning powder is leveled out.

Another advantage of this invention is that the vacuum unit may be operated while cleaning a surface to capture airborne cleaning powder.

10 Yet another advantage of this invention is that the short bristle counter-rotating cylindrical brushes serve as a pile lifter.

While certain embodiments of this invention have been described above, these descriptions are given for purposes of illustration and explanation. Variations, changes, modifications and departures from the systems and methods disclosed
15 above may be adopted without departure from the scope or spirit of this invention.

Claims:

- 1 1. A carpet cleaning device comprising:
 - 2 a) a carpet brush unit having a pair of brushes and a motor for
 - 3 operating the brushes; and
 - 4 b) a backpack vacuum unit connected to the carpet brush unit for
 - 5 directing an air flow through the carpet brush unit.
- 1 2. The device of claim 1 wherein the carpet brush unit further comprises a
- 2 tray for receiving cleaning powder.
- 1 3. The device of claim 1 further comprising a flexible hose for connecting the
- 2 carpet brush unit to the backpack vacuum unit.
- 1 4. The device of claim 2 wherein the tray has two opposed sides and the
- 2 device further comprises a strip extending from each side of the tray and relatively
- 3 near the brushes for facilitating movement of the cleaning powder onto and off of
- 4 the tray.
- 1 5. The device of claim 2 wherein the tray further comprises a dirt collection
- 2 chamber defined by a lower surface of the tray and an interior of the carpet brush
- 3 unit for collecting air, cleaning powder and debris drawn from the region of the
- 4 brushes.
- 1 6. The device of claim 1 wherein an interior of the carpet brush unit
- 2 comprises side walls having slots into which particulate lifted by the brushes is
- 3 directed.

- 1 7. The device of claim 1 wherein the counter rotating brushes is driven by the
2 backpack vacuum unit and lifts carpet pile.
- 1 8. The device of claim 4 wherein the strips are located about one-fourth inch
2 from the brushes.
- 1 9. The device of claim 1 wherein a distance between the brushes and an
2 interior of the carpet brush unit is about one-fourth inch.
- 1 10. The device of claim 4 wherein the strips are adjustable for controlling the
2 amount of cleaning powder uptake onto the tray.
- 1 11. The device of claim 1 further comprising a speed controller for controlling
2 air flow in the vicinity of the brushes.
- 1 12. The device of claim 11 wherein the speed controller comprises a choke for
2 reducing a volume of air exhausted by the backpack vacuum unit.
- 1 13. The device of claim 11 wherein the speed controller comprises a two-speed
2 motor.
- 1 14. The device of claim 11 wherein the speed controller comprises a motor
2 speed control device.
- 1 15. The device of claim 4 further comprising a source of positive air pressure
2 for forcing cleaning powder off of the tray and onto a surface to be cleaned.
- 1 16. A carpet brush and pile lifter for cleaning and lifting carpet comprising:
2 a) a pair of short bristle counter-rotating brushes;
3 b) a shroud having a motor for operating the brushes and an aperture
4 for attaching to a vacuum unit; and

5 c) a plate bottom attached to the shroud and enclosing a chamber
6 between the plate bottom and the shroud, the plate bottom having a strip on each
7 end of the plate bottom, the strip located relatively near the brushes defining an
8 opening between the strips and the brushes for allowing particles to pass between
9 the chamber and the carpet.

1 17. The carpet brush and pile lifter of claim 16 further comprising the vacuum
2 unit operable at multiple speeds.

1 18. The carpet brush and pile lifter of claim 17 further comprising a vessel
2 attached to the vacuum unit for receiving cleaning powder and debris removed
3 from the carpet when the vacuum unit is turned on.

1 19. A combination carpet cleaning brush unit, vacuum and pile lifter device
2 comprising:
3 a) a flexible hose;
4 b) a carpet brush unit having an aperture for attaching a first end of a
5 flexible hose, the carpet brush unit comprising:
6 i) a housing;
7 ii) disposed within the housing short bristle, counter-rotating
8 cylindrical brushes that are relatively widely separated;
9 iii) a tray having two opposed sides and located between the
10 brushes;
11 iv) a pair of strips attached to and extending outwardly from
12 opposite sides of the tray; and
13 iv) a motor for rotating the brushes;
14 c) a handle pivotably attached to the housing; and
15 d) a backpack vacuum unit for attachment to the carpet brush unit at a
16 second end of the flexible hose for receiving particulate removed from the carpet.

1 20. A method for cleaning carpet comprising:

- 2 a) connecting a flexible hose at one end to a housing having a hole
3 therein for receiving the flexible hose and connecting the other end of the flexible
4 hose to a backpack vacuum;
5 b) installing the backpack vacuum unit on a user's back;
6 c) connecting the housing to a power source;
7 d) broadcasting cleaning powder on a surface;
8 e) activating short bristle counter-rotating cylindrical brushes located
9 in the housing and the backpack vacuum unit;
10 f) collecting the cleaning powder on a tray located between the
11 brushes;
12 g) redistributing the cleaning powder from the tray onto the surface;
13 and
14 h) maneuvering the housing over the surface with the backpack
15 vacuum operating to draw the cleaning powder and debris into the backpack
16 vacuum.

1 21. The method of claim 21 wherein the redistributing the cleaning powder from
2 the tray onto the surface is performed using a positive air pressure flowing from the
3 backpack vacuum unit to the tray whereby the cleaning powder is moved from the
4 tray to the carpet.

1 / 3

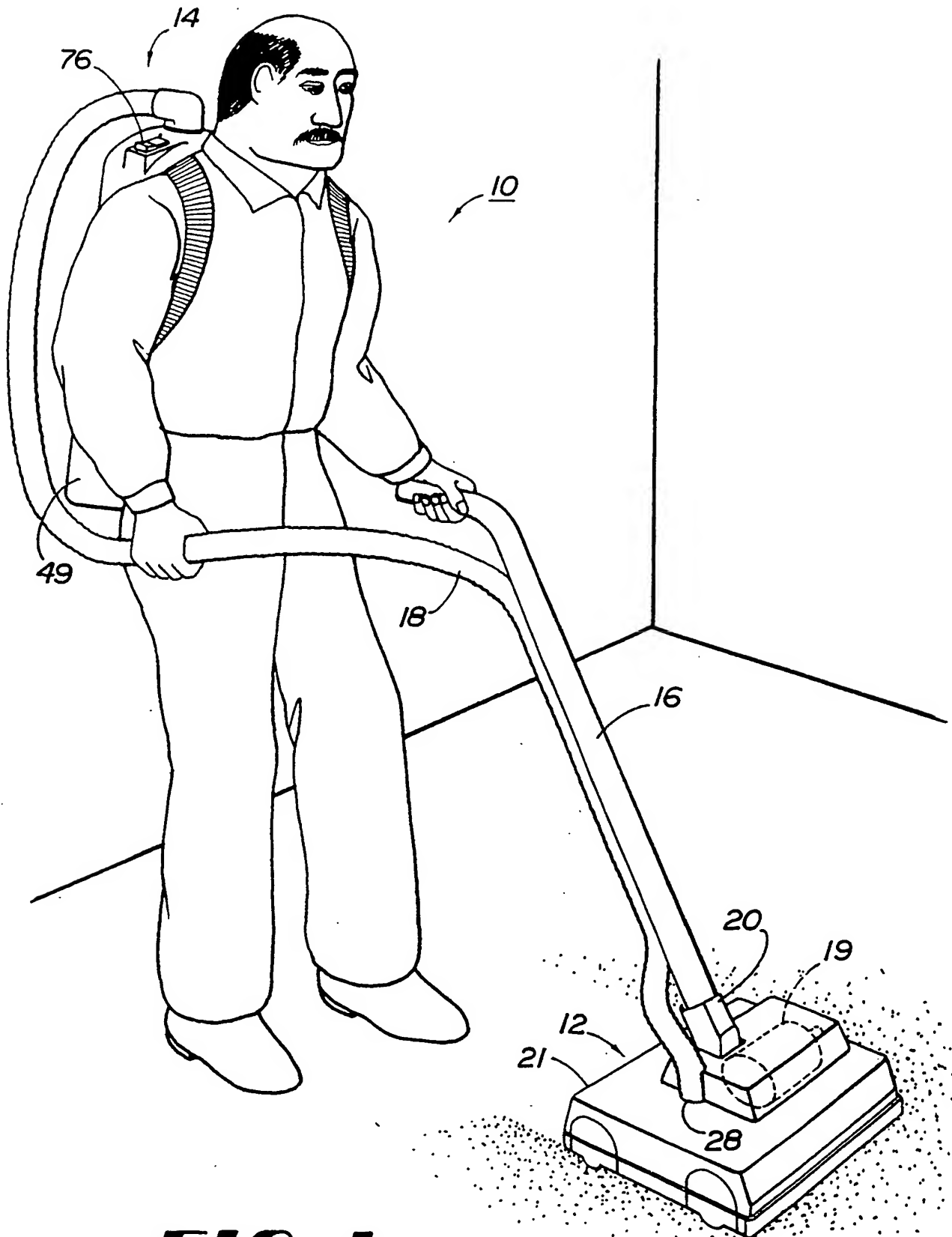


FIG 1

SUBSTITUTE SHEET (RULE 26)

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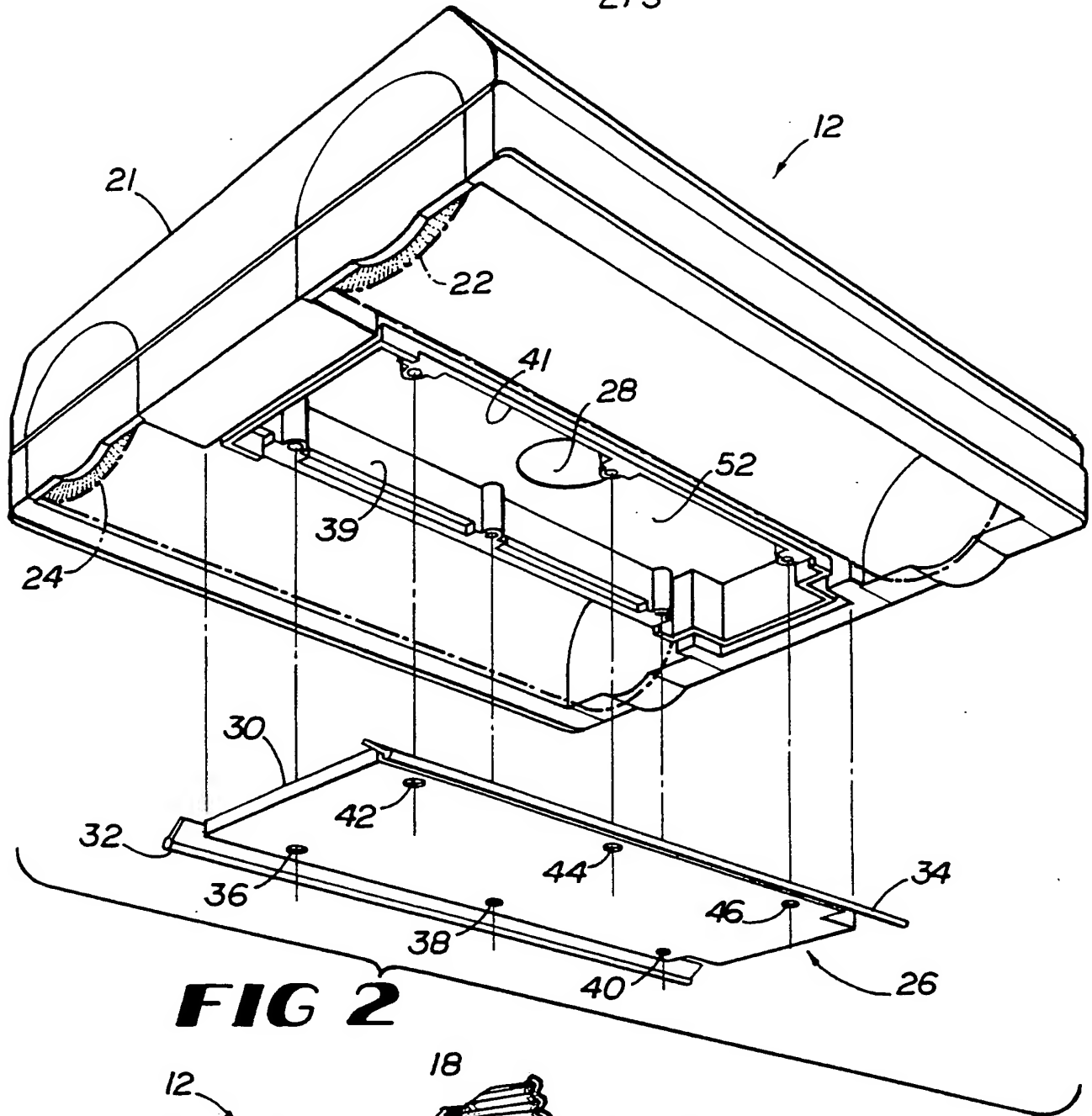


FIG 2

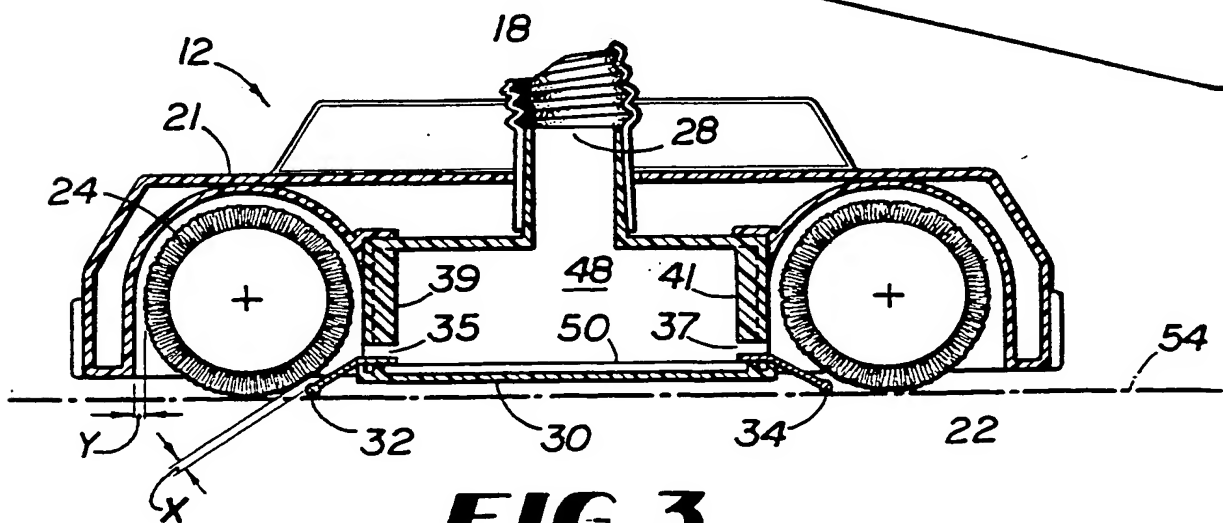


FIG 3

SUBSTITUTE SHEET (RULE 26)

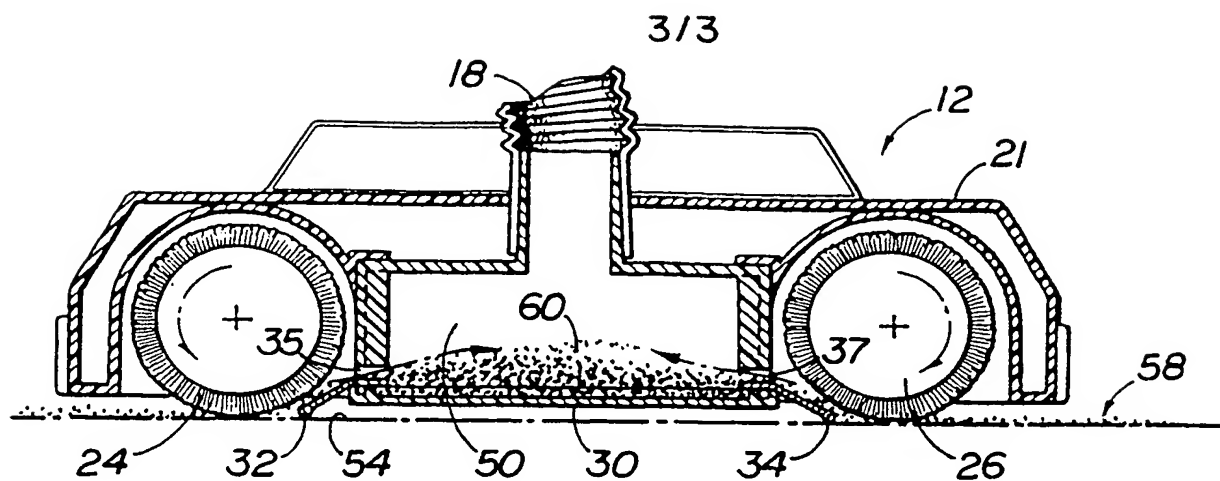


FIG 4A

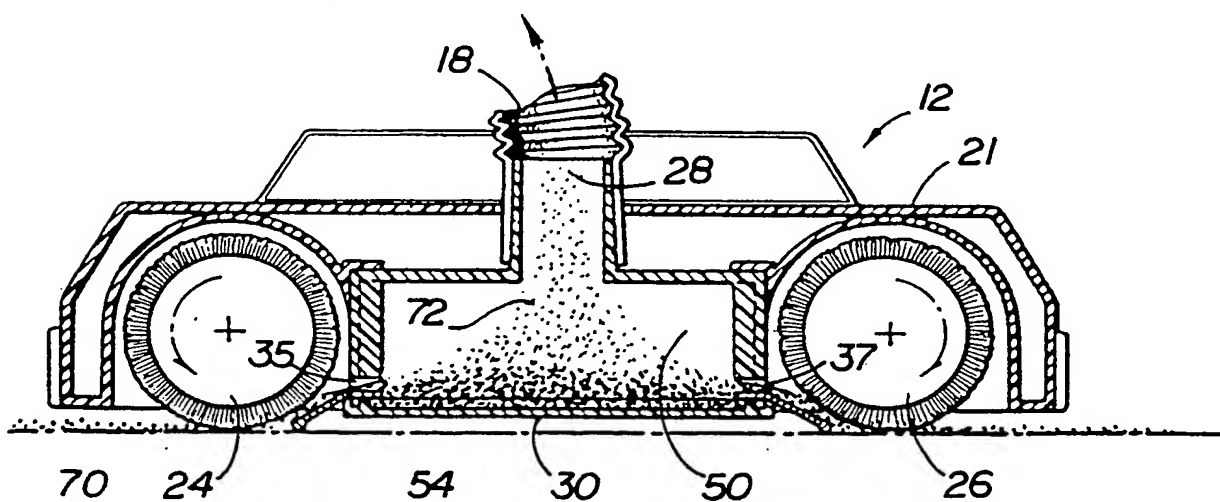


FIG 4C

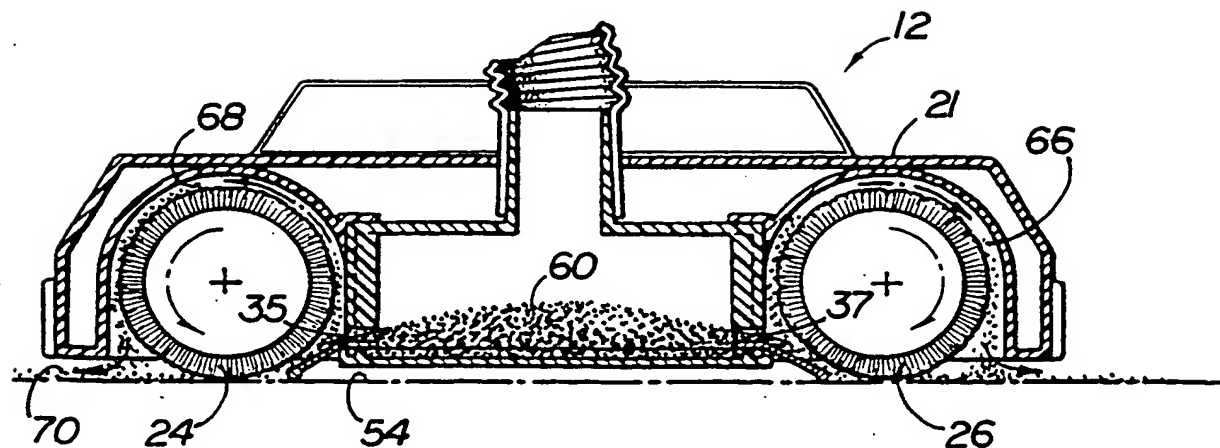


FIG 4B

SUBSTITUTE SHEET (RULE 26)

INTERNATIONAL SEARCH REPORT

International Application No

PCT/US 99/01324

A. CLASSIFICATION OF SUBJECT MATTER

IPC 6 A47L11/34 A47L5/36

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 6 A47L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	DE 295 13 474 U (MASTER VAP) 26 October 1995 see the whole document	16
Y		1,3-7,19
A		20
Y	EP 0 557 096 A (IONA APPLIANCES INC) 25 August 1993 see abstract; figure 1	1,3-7,19
A		19,20
A	US 4 267 617 A (BROWN ROBERT S ET AL) 19 May 1981 see the whole document	1,6
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

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11/05/1999

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Norman, P

INTERNATIONAL SEARCH REPORT

Int .tional Application No
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